REMARKS/ARGUMENTS

Claims 1-14, 16-30, 33-37, 59, and 60 remain in this application. Claims 15, 31, 32, and 38-58 have previously been canceled.

§ 102 Rejections

Applicants respectfully traverse the rejection of claims 1, 13-16, 20, and 59-60 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,148,218 (Knowles).

Claim 1 requires that the tension between the capstans is monitored during the draw process via a load cell and that the speed of one of the capstans is adjusted in response to feedback from the load cell about the monitored tension. There is no mention or suggestion in any of the references cited of adjusting the speed of one or more capstans in response to feedback about the measured tension from a load cell.

According to the Examiner, "it is noted that the claims do not require the tension to be measured: in applicant's embodiment, the load cell would detect a force equal to twice the tension." Applicants disagree, and submit that Examiner's own comment indicates that tension is being measured (i.e., the load cell is measuring a force equal to twice the tension). Both of claims 1 and 20 clearly require that the fiber tension between the capstans is monitored during the draw process and the speed of one of the capstans is adjusted in response to the monitored tension to maintain a desired tensile screening force on the fiber. "Monitor" is defined in the American Heritage Dictionary as "to scrutinize or check systematically with a view to collecting certain specified categories of data" (see copy of definition enclosed in previous response). Even if, assuming arguendo, Examiner is correct in indicating that the load cell would detect a force equal to twice the tension, this is irrelevant, as even in this situation the fiber tension would be measured, albeit perhaps not entirely accurately. On the other hand, Applicants submit that even if the load cell did detect a force equal to twice the tension, in fact this would be an accurate measurement because the operator would know that this is the case.

Knowles does not disclose the fiber tension being monitored during the draw process, nor does Knowles disclose monitoring such tension via a load cell, nor does

Knowles disclose adjusting the speed of one capstan in response to feedback from the load cell about the monitored tension to maintain a desired tensile screening force on the fiber.

The Examiner again indicates that "it is noted that the term "load cell" is not defined in the specification." It is well known that a load cell is a transducer used to measure force or weight. Load cells convert weight or force into electrical signals which can be used to actuate or drive a variety of measuring or control apparatus. A further example of a reference showing a strain gauge load cell is submitted herewith. In particular, Mechanical Measurements, by T. G. Beckwith, pages 313-317, discuss strain gauge load cells. In addition, a historical account of the development of load cell design is also submitted herewith. According to the Examiner, "since applicants' cell and Knowles serve the same function (i.e. monitor tension so as to maintain tension) it is deemed that Knowles' clutch is a "load cell"." Applicants disagree, this is tantamount to saying that a car is a bicycle, as both of them serve the same function (transportation). It is clear that the Knowles clutch is not a load cell. Also, the term "clutch" is not defined in the specification of Knowles et al, and applicants can find no dictionary definition that would support the use of the word clutch to mean a load cell. Instead, applicants submit that a clutch is a device for engaging and disengaging two working parts of a shaft or of a shaft in a driving mechanism, or alternatively, the lever, pedal, or other apparatus that activates such a device (American Heritage Dictionary—see definition enclosed herewith).

Claims 1 and 20 both require that the tension in said fiber between said screener capstan and said another capstan is monitored and the circumferential speed of said screener capstan is adjusted in response to said monitored tension. As mentioned above, "monitor" is defined in the American Heritage Dictionary as "to keep track of by or as if by an electronic device" or "to scrutinize or check systematically with a view to collecting certain specified categories of data". Page 10, lines 26-29, of applicants' specification indicates that "turn around pulley 22 is connected to a load cell which monitors the amount of tension applied onto the turn around pulley by the passing fiber, and thus monitors the amount of tension being imparted to the fiber." Similarly, page 11,

lines 7-9, indicate that "Feedback from the load cell of the turn around pulley 22 is used to adjust the differential speed of the screening capstan 24 so that a sufficient screening tension is maintained consistently throughout drawing of the entire optical fiber blank into optical fiber." Thus, clearly, in applicants' case, an electronic device keeps track of the tension, and collects information about the tension which is then used to adjust the circumferential speed of said screener capstan, depending on whether the tension is too high or too low. Consequently, it is clear that Knowles device does not "monitor" the tension as that term is employed in applicants' specification and claims.

According the Examiner, "Applicants' apparatus and the Knowles' apparatus work on the same principle—the difference in capstan speeds causes the tension." While applicants understand but do not necessarily agree with Examiner's statement, even if, assuming arguendo, the Knowles' apparatus works on a similar principle, the Knowles apparatus does not disclose a load cell.

Claims 59 and 60 require that the monitoring be done electronically. It is submitted that none of the prior art references, alone or in combination, describe electronic monitoring of the tension at load cell and adjusting in response to feedback from a load cell. According to the Patent Office, claims 59-60 are clearly met. Applicants cannot understand this rejection at all as electronic monitoring does not appear to be mentioned in Knowles. It would greatly appreciated if the Patent Office could explain this rejection further.

§ 103 Rejections

Applicants respectfully traverse the Examiner's rejection of claims 1-3, 11, 13, 14, 16-22, and 36-37 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,148,218 (Knowles).

According to the Patent Office, "As an alternative to the above discussion: Knowles doesn't disclose the type of clutch. In accordance with the basic laws of physics: one realizes that if one changes power transfer of a clutch (as Knowles discloses), since the total amount of supplied torque is constant, one would want to use a clutch which will change the velocity of the capstan, because one cannot change the

power without an inherent change in the velocity." Applicants respectfully do not understand the point the Examiner is trying to make, and if Examiner could clarify how this comment is relevant to the rejection it would be greatly appreciated by applicants. As far as applicants are aware, nowhere in any of applicants claims is a clutch being claimed, yet the Examiner seems to be indicating that it would be obvious to use a clutch in view of Knowles. Just to clarify, applicants are not claiming to have invented a clutch which will change the velocity of the capstan, nor is applicant claiming a clutch that changes the slippage rate when one changes the power output. As mentioned above, Knowles does not mention or suggest using a load cell, nor does Knowles mention or suggest monitoring the fiber tension between the capstans during the draw process via a load cell, nor does Knowles suggest or mention adjusting the speed of one of the capstans and in response to feedback from the load cell about the monitored tension.

Applicants also disagree with the Examiner's statement that Knowles doesn't disclose the type of clutch. It is clear from the teaching of Knowles that the clutch employed in Knowles is a conventional mechanical clutch and frankly do not understand how this point would be relevant. Is the Examiner indicating that one type of clutch is a load cell? As far as applicants are aware, there is no dictionary definition of clutch that would include load cells as an example.

With respect to claim 2, applicants disagree that it would have been obvious to draw the fiber as fast as possible so as to make as much fiber as possible. The Examiner has indicated that, once the fiber is pulled through the second tractor assembly, the speed of the tractor assembly is reduced causing the constant torque device to overload and the clutch to slip. Obviously, the faster one draws the fiber the more the clutch will slip, possibly and even probably to the point where if you pull it as fast as possible, as the Examiner suggests, then it will likely apply little or no torque at all to the optical fiber. Consequently, applicants submit that there would be no motivation to modify Knowles as proposed by the Examiner, and based on the Examiner's own comments, applicants believe that one skilled in the art would be motivated <u>not</u> to try to increase the draw speed.

According to the Examiner with respect to claim 17, "It would have been obvious to have all of the features being connected and/or controlled by a computer so as to easily monitor the process variables, and to store the date so that one can go back and review what went wrong and what went right." Applicants submit that the statement by the Examiner is not mentioned or suggested at all by any of the references, and in fact the Examiner is merely stating the advantage of applicants' invention as defined by claim 17 and indicating that it would have been obvious, with no apparent motivation to make the modification proposed. This is clearly a hindsight reconstruction by the Patent Office.

Applicants disagree that it would have been obvious to draw the fiber as fast as possible so as to make as much fiber as possible. The Examiner has indicated that, once the fiber is pulled through the second tractor assembly, the speed of the tractor assembly is reduced causing the constant torque device to overload and the clutch to slip. Obviously, the faster one draws the fiber the more the clutch will slip, possibly and even probably to the point where if you pull it as fast as possible, as the Examiner suggests, then it will likely apply little or no torque at all to the optical fiber. Consequently, applicants submit that there would be no motivation to modify Knowles as proposed by the Examiner, and based on the Examiner's own comments, applicants believe that one skilled in the art would be motivated <u>not</u> to try to increase the draw speed.

Applicants respectfully traverse the Examiner's rejection of claims 4-12, 23-30, 33-35 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,148,218 (Knowles), and further in view of U.S. Patent No. 5,787,216 (Bice).

According the Examiner, "Knowles does not disclose the ends being accessed for the optical testing. Bice, starting at column 1, line 26, discloses that one of the most important tests is OTDR which requires that the fiber be such that light travels from one end of the fiber (and back?). This requires that light be accessible to both ends of the fiber because it must travel to the second end if it is to reflect back from that end."

As applicants indicate on page 9, lines 14 through 18, "because the spool enables access to both ends of the fiber, optical and other testing can be conducted on the fiber which is stored upon spool 15 after the fiber draw and winding process, without having to remove the entire length of fiber from the spool or rethread the fiber onto a different

spool." Thus, it is clear from applicants' specification that, by access, applicants mean that the tool must enable both ends of the fiber to be mechanically accessed. An example of such spool which will enable such access to both ends of the fiber is illustrated in Fig. 6, which of course the above description is directed to.

In view of the above amendments and the following remarks, favorable reconsideration of the outstanding office action is respectfully requested.

Based upon the above amendments, remarks, and papers of records, applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Applicant believes that no extension of time is necessary to make this Reply timely. Should applicant be in error, applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

Please direct any questions or comments to Robert L. Carlson at 607-974-3502.

Respectfully submitted,

DATE: September 16, 2004

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MECHANICAL MEASUREMENTS

by

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and

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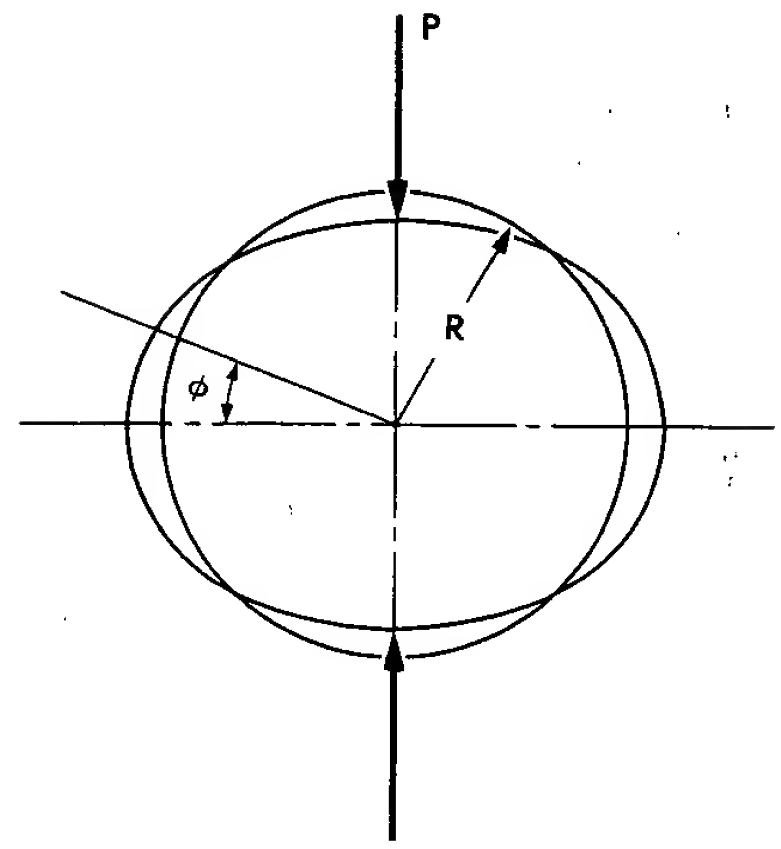

FIG. 11–8. Ring loaded diametrically in compression.

readings still will be obtained provided both zero and loaded readings are made by the same person. With 40 to 64 micrometer threads per inch, readings may be made to one- or two-hundred thousandths of an inch [5].

The equation given in Table 11–1 for circular rings is derived with the assumption that the radial thickness of the ring is small compared with the radius. Most proving rings are made of section with appreciable radial thickness. However, Timoshenko [6] shows that use of the thin-ring rather than the thick-ring relations introduces errors of only about 4% for a ratio of section thickness to radius of 1/2. Increased stiffness in the order of 25% is introduced by the effects of integral bosses [5]. It is, therefore, apparent that use of the simpler thin-ring equation is normally justified.

Stresses may be calculated from the bending moments, M, determined by the relation [6]

$$M = \frac{PR}{2}\left(\cos\phi - \frac{2}{\pi}\right). \tag{11–6}$$

Symbols correspond to those shown in Fig. 11–8.

(c) *Strain-gauge load cells.* Instead of using total deflection as a measure of load, the strain-gauge load cell measures load in terms of *unit* strain. Resistance gauges are very suitable for this purpose (see Chapter 10). One of the many possible forms of elastic member is selected, and the gauges are mounted to provide maximum output. If the loads to be measured are large, the direct tensile-compressive member may be used. If the loads are small, strain amplification provided by bending may be employed to advantage.

Figure 11–9 illustrates the arrangement for a tensile-compressive cell using all four gauges sensitive to strain and providing temperature com-

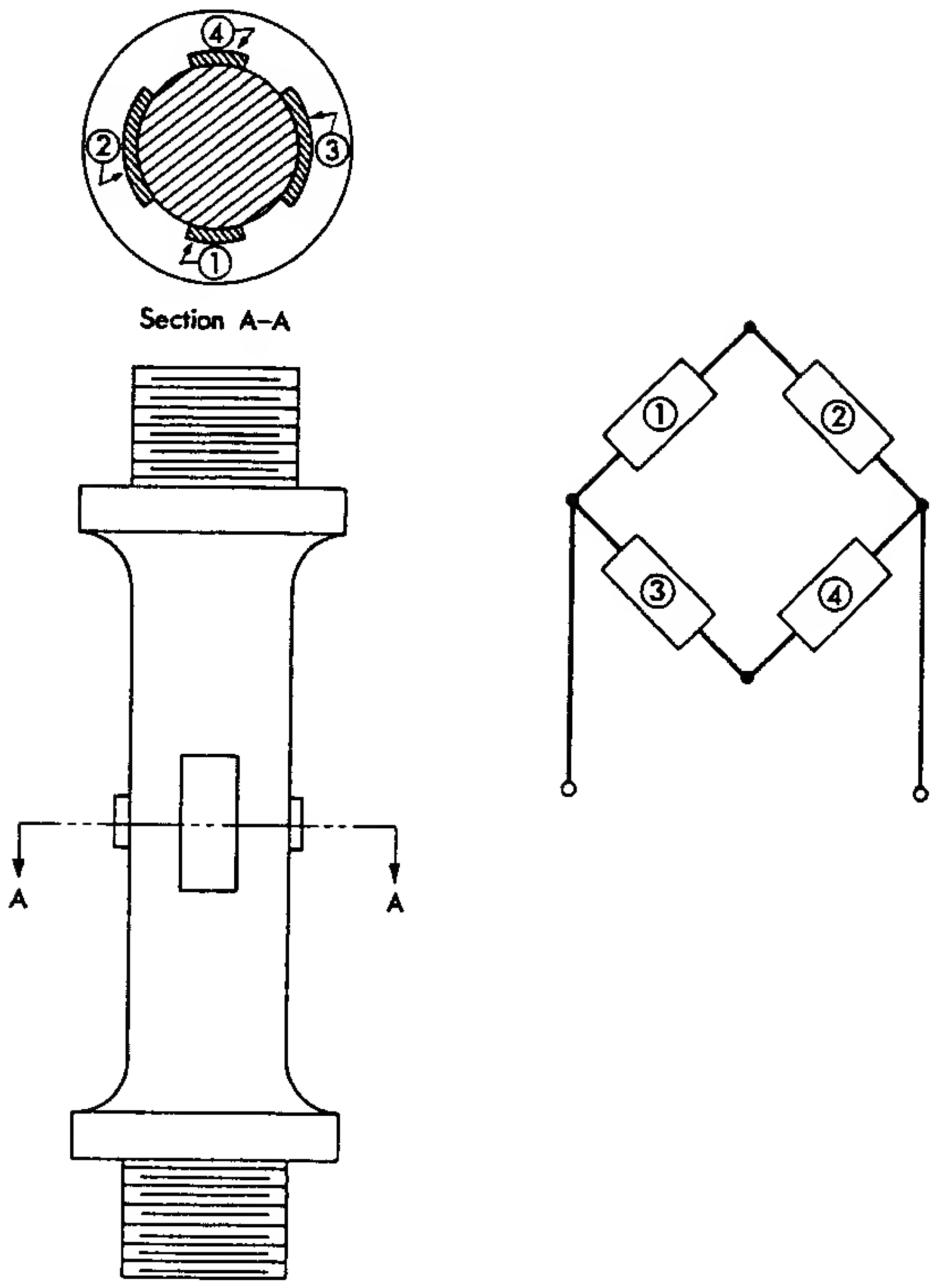

FIG. 11–9. Tension-compression resistance strain-gauge load cell.

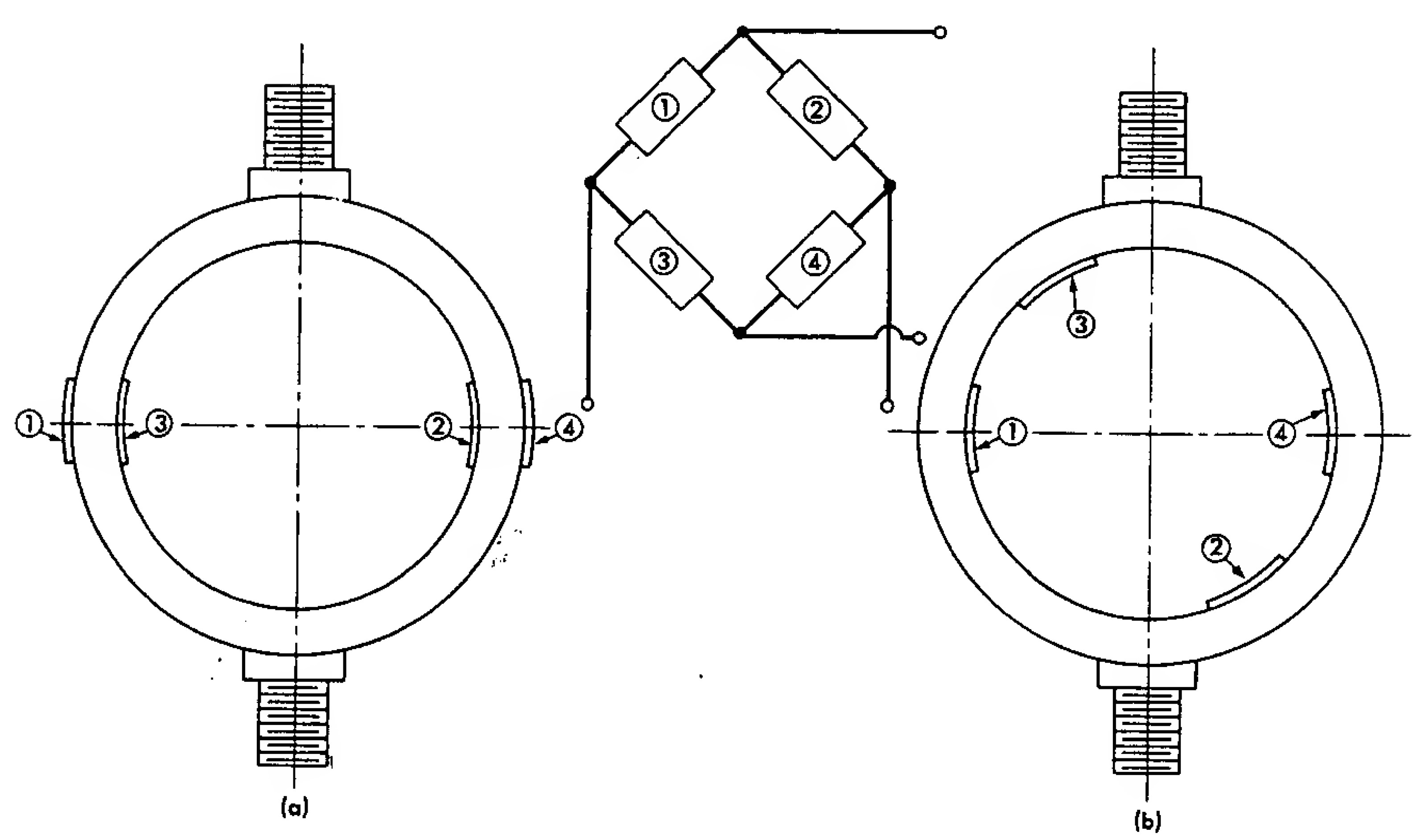

FIG. 11–10. Two arrangements of circular-shaped load cells employing resistance strain gauges as secondary transducers.

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pensation for the gauges. The bridge constant (Art. 10–9d) in this case will be $2(1 + \mu)$, where μ is Poisson's ratio for the material. Compression cells of this sort have been used with a capacity of 3 million pounds [8]. Simple beam arrangements may also be used, as illustrated in Figs. 10–13 and 10–34.

Figures 11–10(a) and (b) illustrate proving-ring strain-gauge load cells. In Fig. 11–10(a) the bridge output is a function of the bending strains only, the axial components being canceled in the bridge arrangement. By mounting the gauges as shown in Fig. 11–10(b), somewhat greater sensitivity may be obtained because the output includes both the bending and axial components sensed by gauges 1 and 4.

(d) *Temperature sensitivity.* The sensitivity of elastic load-cell elements is affected by temperature variation. This change is caused by two factors: variation in Young's modulus and altered dimensions, both brought about by temperature change. Variation in Young's modulus is the more important of the two effects, amounting to roughly $2\frac{1}{2}\%$ per 100°F. On the other hand, the increase in cross-sectional area of a tension member of steel will amount to only about 0.15% per 100°F change.

Obviously, when accuracies of $\pm\frac{1}{2}\%$ are desired, as provided by certain commercial cells, a means of compensation, particularly for variation in Young's modulus, must be supplied. When resistance strain gauges are used as secondary transducers, this is accomplished electrically by causing the bridge's electrical sensitivity to change in the opposite direction to the modulus effect [9]. As temperature increases, the deflection constant for the elastic element decreases; it becomes more *springy,* and deflects a greater amount for a given load. This increased sensitivity is offset by reducing the sensitivity of the strain-gauge bridge through use of a thermally sensitive compensating resistance element, R_s, as shown in Fig. 11–11.

As discussed in Art. 6–18d, the introduction of a resistance in an input-lead reduces the electrical sensitivity of an equal-arm bridge by the factor n, expressed as follows:

$$n = \frac{1}{1 + (R_s/R)}.$$

Requirements for compensation may be analyzed through use of the relation for the initially balanced equal-arm bridge, Eq. (6–44). If we assume

$$2\,\frac{\Delta R}{R} \ll 4,$$

Eq. (6–44) may be modified to read

$$\frac{\Delta e_o}{e_i} = \frac{k}{4}\,\frac{\Delta R}{R}.$$

This is true, particularly for a *strain-gauge bridge* for which $\Delta R/R$ is always small. A bridge constant, k, is included to account for use of more than one active gauge. If all four gauges are equally active, $k = 4$. For the arrangement shown in Fig. 11-9, $k = 2(1 + \mu)$, where μ is Poisson's ratio. If we account for the compensating resistor, the equation will then read

$$\frac{\Delta e_o}{e_i} = \frac{k}{4}\frac{\Delta R}{R}\left[\frac{1}{1 + (R_s/R)}\right]. \tag{11-7}$$

Rewriting Eq. (10-7),

$$\epsilon = \left(\frac{1}{F}\right)\left(\frac{\Delta R}{R}\right),$$

and from the definition of Young's modulus, E, Eq. (10-2),

$$P = EA\epsilon.$$

We may solve for sensitivity,

$$\frac{\Delta e_o}{P} = \left(\frac{e_i}{4}\right)\left(\frac{FRk}{A}\right)\left[\frac{1}{E(R + R_s)}\right]. \tag{11-8}$$

If it is assumed that the gauges are arranged for compensation of resistance variation with temperature and that the gauge factors F remain unchanged with temperature, and, further, that any change in the cross-sectional area of the elastic member may be neglected, then complete compensation will be accomplished if the quantity $E(R + R_s)$ remains constant with temperature.

Using Eqs. (6-20) and (6-28), we may write

$$E(R + R_s) = E(1 + c\,\Delta T)[R + R_s(1 + b\,\Delta T)], \tag{11-9}$$

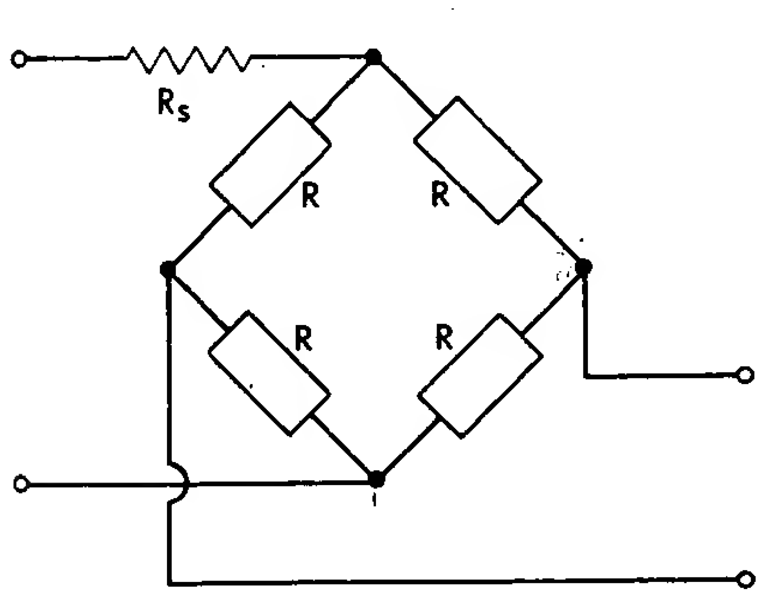

FIG. 11-11. Schematic diagram of a strain-gauge bridge with a compensation resistor.

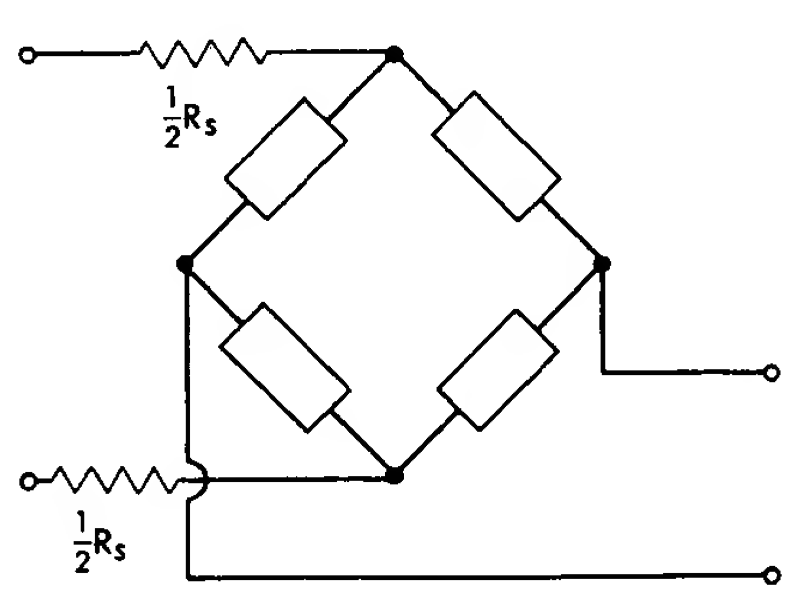

FIG. 11-12. Strain-gauge bridge with two compensation resistors.

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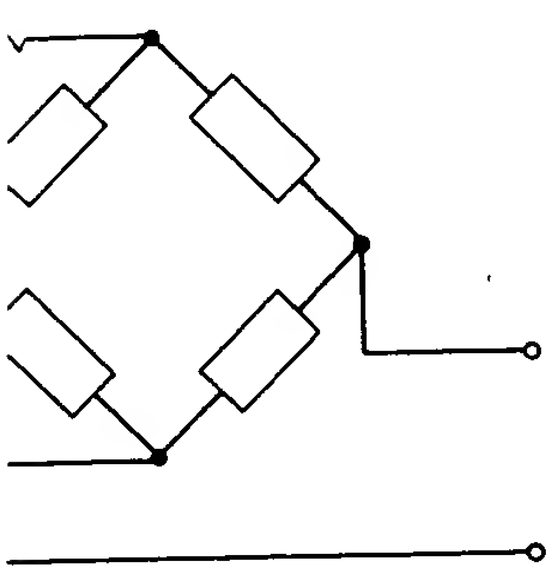

12. Strain-gauge bridge
compensation resistors.

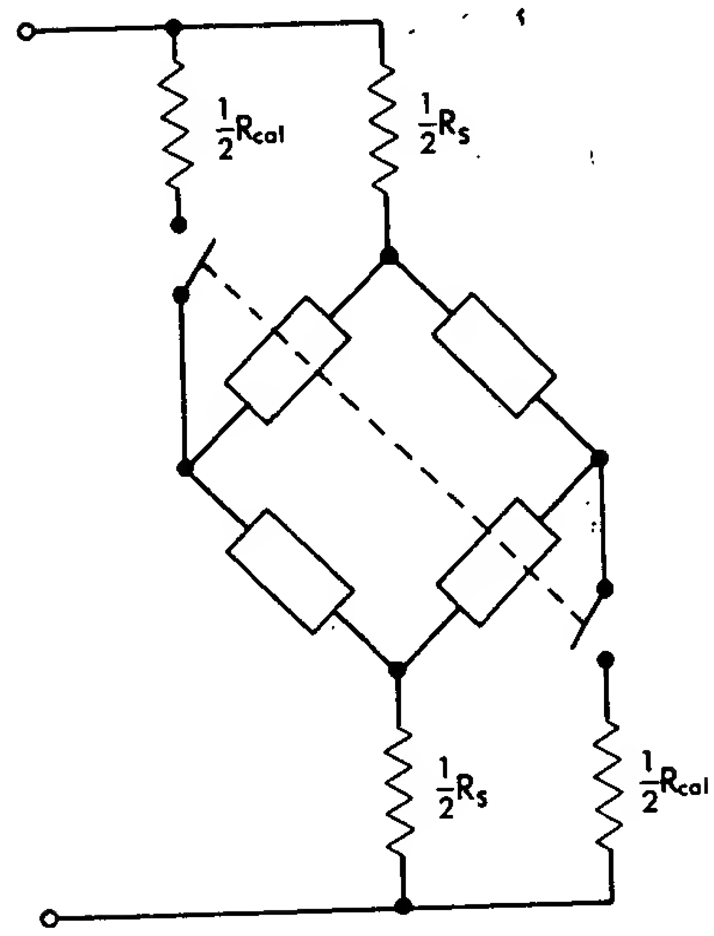

FIG. 11–13. Schematic diagram of a strain-gauge bridge showing how calibration may be accomplished.

from which we find

$$\frac{R_s}{R} = -\frac{c}{b+c}. \tag{11–10}$$

This indicates that temperature compensation may possibly be accomplished through proper balancing of the temperature coefficients of Young's modulus, c, and electrical resistivity, b. Because c is usually negative (see Table 6–1) and because the resistances cannot be negative, it follows that

$$b > -c.$$

In addition, we may write [See Eq. (5–2)]

$$R_s = \rho\frac{L}{A} = -R\left(\frac{c}{b+c}\right), \tag{11–11}$$

from which

$$L = -\frac{RA}{\rho}\left(\frac{c}{b+c}\right). \tag{11–11a}$$

From these relations, specific requirements for compensation may be derived. After a resistance material, usually in the form of wire, is selected, the required length may be determined through use of Eq. (11–11a).

Although a single resistor would serve, commercial cells normally use two modulus resistors, as shown in Fig. 11–12. This assures proper connections regardless of instrumentation and also permits electrical calibra-

single source for people who need to be r[illegible]

THE AMERICAN HERITAGE DICTIONARY

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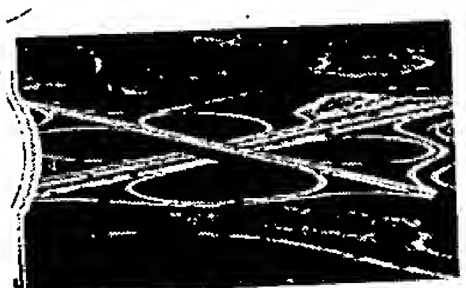
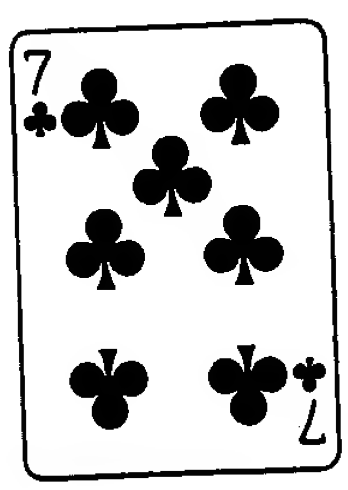
clove spice < OFr. *clou (de girofle),* nail (of the clove tree) < Lat. *clavus,* nail.]
clove² (klōv) *n.* One of the small sections of a separable bulb, such as that of garlic. [ME < OE *clufu.*]
clove³ (klōv) *v.* A past tense and archaic past participle of **cleave¹**.
clove⁴ (klōv) *v. Archaic.* Past tense of **cleave²**.
clove hitch *n. Naut.* A knot used to secure a line to a spar, post, or other object, consisting of two turns with the second held under the first. [ME *clove,* split, p.part. of *cleven,* to split < OE *clēofan.*]
clo·ven (klō′vən) *v.* A past participle of **cleave¹**. —*adj.* Split; divided.
cloven foot *n.* A cloven hoof. —**clo′ven-foot′ed** *adj.*
cloven hoof *n.* **1.** A divided or cleft hoof, as in deer or cattle. **2.** Evil, based on the usual depiction of Satan as a figure with cloven hoofs.
clo·ven-hoofed (klō′vən-ho͞oft′, -ho͝oft′, -ho͞ovd′, -ho͝ovd′) *adj.* **1.** Having cloven hoofs, as cattle do. **2.** Satanic; devilish.
clove oil *n.* An aromatic oil distilled from the dried flower buds of the clove tree, used in medicine as an antiseptic.
clove pink *n.* A variety of the carnation, *Dianthus caryophyllus,* having flowers with a spicy fragrance.
clo·ver (klō′vər) *n.* **1.** A plant of the genus *Trifolium,* having compound leaves with three leaflets and tight heads of small flowers. Many species provide valuable pasturage. **2.** Any of several plants related to the clover, such as the bush clover. —*idiom.* **in clover.** Living a carefree life of ease, comfort, or prosperity. [ME < OE *clǣfre.*]
clo·ver·leaf (klō′vər-lēf′) *n.* A highway interchange at which two highways crossing each other on different levels are provided with curving access and exit ramps enabling vehicles to go in any of four directions.


cloverleaf

clown (kloun) *n.* **1.** A buffoon or jester who entertains by jokes, antics, and tricks in a circus, play, or other presentation. **2.** A coarse, rude, vulgar person; boor. **3.** A rustic or peasant. —*intr.v.* **clowned, clown·ing, clowns. 1.** To behave like a clown or buffoon. **2.** To perform as a jester or clown. [Perh. of LG orig.] —**clown′ish** *adj.* —**clown′ish·ly** *adv.* —**clown′ish·ness** *n.*


clown

clox·a·cil·lin (klŏk′sə-sĭl′ĭn) *n.* A synthetic antibiotic of the penicillin group that is effective against staphylococci. [C(H)L(ORO)- + OX- + A(ZO) + (PENI)CILLIN.]
cloy (kloi) *v.* **cloyed, cloy·ing, cloys.** —*tr.* To supply with too much of something, esp. with something too rich or sweet; surfeit. —*intr.* To cause to feel surfeited. [Obs. *accloy* < ME *acloien.*] —**cloy′ing·ly** *adv.* —**cloy′ing·ness** *n.*
cloze (klōz) *n.* A test of reading comprehension in which the test taker is asked to supply words that have been systematically deleted from a text. [Alteration of CLOSURE.] —**cloze** *adj.*
club (klŭb) *n.* **1.** A stout, heavy stick, usually thicker at one end than at the other, suitable for use as a weapon; cudgel. **2.** A bat or stick used in certain games to drive a ball, esp. a stick with a curved head used in such games as golf and hockey. **3. a.** A black figure on a playing card, shaped like a trefoil or clover leaf. **b.** A card marked with such figures. **c. clubs.** The suit so marked. **4.** A group of people organized for a common purpose, esp. a group that meets regularly. **5.** The room, building, or other facilities used for the meetings of a club. —*modifier: club regulations.* —*v.* **clubbed, club·bing, clubs.** —*tr.* **1.** To strike or beat with or as if with a club. **2.** To use (a rifle or similar firearm) as a club by holding the barrel and hitting with the butt end. **3.** *Archaic.* To gather or combine (hair, for example) into a clublike mass. **4.** To contribute for a joint or common purpose. —*intr.* **1.** *Archaic.* To form or gather into a mass. **2.** To join or combine for a common purpose; form a club. [ME < ON *klubba.*]


club

club·ba·ble also **club·a·ble** (klŭb′ə-bəl) *adj. Informal.* Suited to membership in a social club; sociable.
club·by (klŭb′ē) *adj.* **-bi·er, -bi·est. 1.** Typical of a club or club members. **2.** Friendly; sociable. **3.** Clannish; exclusive. —**club′bi·ness** *n.*
club car *n.* A railroad passenger car equipped with lounge chairs, tables, a buffet or bar, and other extra comforts.
club chair *n.* An upholstered easy chair with arms and a low back.
club·foot (klŭb′fo͝ot′) *n.* **1.** Congenital deformity of the foot, marked by a misshapen appearance often resembling a club. **2.** A foot so deformed. —**club′foot′ed** *adj.*
club·house (klŭb′hous′) *n.* **1.** A building occupied by a club. **2.** The locker room for a sports team.
club·man (klŭb′mən, -măn′) *n.* A man who is a member of a club or clubs, esp. one who is active in club life.


Clumber spaniel

club moss *n.* Any of various evergreen, erect or creeping, mosslike plants of the genus *Lycopodium,* having tiny, scalelike, overlapping leaves and reproducing by spores. [From the club-shaped strobiles on some species of this plant.]
club root *n.* A disease of cabbage and related plants, caused by a fungus, *Plasmodiophora brassicae,* and resulting in large, distorted swellings on the roots.
club sandwich *n.* A sandwich, usually of three slices of bread, with a filling of various meats, tomato, lettuce, and dressing.


Clydesdale

club soda *n.* An effervescent, unflavored water used in various alcoholic and nonalcoholic drinks.
club steak *n.* Delmonico steak.
club·wom·an (klŭb′wo͝om′ən) *n.* A female member of a club or clubs, esp. one who is active in club life.
cluck (klŭk) *n.* **1. a.** The characteristic sound made by a hen when brooding or calling her chicks. **b.** A sound resembling a cluck. **2.** *Informal.* A stupid or foolish person. —*v.* **clucked, cluck·ing, clucks.** —*intr.* **1.** To utter a cluck. **2.** To make a sound similar to a cluck, as in coaxing a horse. —*tr.* **1.** To call by making a cluck. **2.** To express by clucking: *He clucked disapproval.* [Imit.]
clue also **clew** (klo͞o) —*n.* Something that guides or directs in the solution of a problem or mystery. —*tr.v.* **clued, clue·ing** or **clu·ing, clues** also **clewed, clew·ing, clews.** To give (someone) guiding information: *Clue me in on what's happening.* [Var. of CLEW (from Theseus' use of a thread as a guide through the Cretan labyrinth).]
Clum·ber spaniel also **clum·ber spaniel** (klŭm′bər) *n.* A dog of a breed developed in England, having short legs and a silky, predominantly white coat. [After *Clumber,* an estate in Nottinghamshire, England.]
clump (klŭmp) *n.* **1.** A clustered mass; lump. **2.** A thick grouping, as of trees or bushes. **3.** A heavy dull sound; thud. —*v.* **clumped, clump·ing, clumps.** —*intr.* **1.** To form clumps. **2.** To walk with a heavy dull sound. —*tr.* To gather into or form clumps of. [Prob. LG *klump* < MLG *klumpe.*] —**clump′y** *adj.*
clum·sy (klŭm′zē) *adj.* **-si·er, -si·est. 1.** Lacking physical coordination, skill, or grace; awkward. **2.** Awkwardly made; unwieldy: *clumsy wooden shoes.* **3.** Gauche; inept: *a clumsy excuse.* [< obs. *clumse,* to be numb with cold < ME *clomsen,* of ON orig.] —**clum′si·ly** *adv.* —**clum′si·ness** *n.*
clung (klŭng) *v.* Past tense and past participle of **cling**.
clunk (klŭngk) *n.* **1.** A dull sound; thump. **2.** A hefty blow. **3.** A stupid or dull person. —*v.* **clunked, clunk·ing, clunks.** —*intr.* **1.** To make or move with a clunk. **2.** To strike something with a clunk. —*tr.* To strike with a clunk. [Imit.]
clunk·er (klŭng′kər) *n.* **1.** A rattletrap, esp. an old car. **2.** A failure; flop.
clu·pe·id (klo͞o′pē-ĭd) *n.* Any of various oily, soft-finned fishes of the family Clupeidae, which includes the herrings and menhadens. —*adj.* Of or belonging to the Clupeidae. [NLat. *Clupeidae,* family name < Lat. *clupea,* a kind of small fish.]
clus·ter (klŭs′tər) *n.* **1.** A group of the same or similar elements gathered or occurring closely together; bunch. **2.** Two or more successive consonants in a word, as *cl* and *st* in the word *cluster.* —*v.* **-tered, -ter·ing, -ters.** —*intr.* To gather or grow into clusters. —*tr.* To cause to grow or form into clusters. [ME < OE *clyster.*]
cluster headache *n.* A severe headache similar to migraine that can occur several times daily for a period of weeks.
clutch¹ (klŭch) *v.* **clutched, clutch·ing, clutch·es.** —*tr.* **1.** To grasp and hold tightly. **2.** To seize or snatch. —*intr.* To attempt to grasp or seize: *clutch at the ring.* —*n.* **1.** A hand, claw, talon, or paw in the act of grasping. **2.** A tight grasp. **3.** Often **clutches.** Control or power: *the clutches of sin.* **4.** A device for gripping and holding. **5. a.** Any of various devices for engaging and disengaging two working parts of a shaft or of a shaft and a driving mechanism. **b.** The lever, pedal, or other apparatus that activates such a device. **6.** A tense or critical situation: *came through in the clutch.* [ME *clucchen,* var. of *clicchen* < OE *clyccan.*]
clutch² (klŭch) *n.* **1.** The number of eggs produced or incubated at one time. **2.** A brood of chickens. —*tr.v.* **clutched, clutch·ing, clutch·es.** To hatch (chicks). [Var. of dial. *cletch,* perh. < *cleck,* to hatch < ME *clekken* < ON *klekja.*]
clut·ter (klŭt′ər) *n.* **1.** A confused or disordered state or collection; jumble: *clutter in the attic.* **2.** A confused noise; clatter. —*v.* **-tered, -ter·ing, -ters.** —*tr.* To litter or pile in a disordered state: *cluttered up the garage with tools and boxes.* —*intr.* **1.** To run or move with bustle and confusion. **2.** To make a clatter. [Prob. < ME *cloteren,* to clot.]
Clydes·dale (klīdz′dāl′) *n.* A large, powerful draft horse of a breed developed in the Clyde valley, Scotland.
clyp·e·ate (klĭp′ē-ĭt) also **clyp·e·at·ed** (-ā′tĭd) *adj.* **1.** Shaped like a round shield. **2.** Having a clypeus.
clyp·e·us (klĭp′ē-əs) *n., pl.* **-e·i** (-ē-ī′). *Biol.* A shieldlike structure, esp. a plate on the front of the head of an insect. [NLat. < Lat. *clipeus,* round shield.] —**clyp′e·al** *adj.*
clys·ter (klĭs′tər) *n. Med.* An enema. [ME *clister* < Lat. *clyster* < Gk. *klustēr,* clyster pipe < *kluzein,* to wash out.]
Cly·tem·nes·tra (klī′təm-nĕs′trə) *n. Gk. Myth.* The wife of Agamemnon. [Lat. < Gk. *Klutaimnēstra.*]
Cm The symbol for the element curium.
cni·do·blast (nī′də-blăst′) *n.* A modified interstitial cell in coelenterates that produces a nematocyst. [Gk. *knidē,* nettle + -BLAST.]
Co The symbol for the element cobalt.
co– *pref.* **1.** With; together; joint; jointly: *coeducation.* **b.** Subordinate or assistant: *copilot.* **2. a.** Partner or associate in an activity: *co-author.* **3.** To the same extent or degree: *coextend.* **4.** Complement of an angle: *cotangent.* [ME < Lat. < *com-,* com-.]